PATENT SPECIFICATION

DRAWINGS ATTACHED

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829,782

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International Classification: —H02k.

COMPLETE SPECIFICATION

An Electro-Magnetically Driven Oscillating Movement Compressor

We, SOCIETE ANONYME DES USINES CHAUSSON, a joint stock French Company, of 35, rue Malakoff, Asnieres, Seine, France, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an electro-magnetically driven oscillating movement compressor in which a magnetically polarized armature oscillates in an alternating field produced by ocils fed with alternating current.

It relates to synchronously operated electro-magnetically driven compressors in which a movable assembly comprising the compressor member and polarized armature is carried by resilient elements for instance formed by a flexible plate whose resilient characteristics are so determined that the movable assembly has a natural vibration frequency that is slightly lower than the frequency of the exciting alternating current. These compressors have the advantage of being self-regulating, for, when the counter-pressure of the delivered fluid increases, as is the case in a refrigerator in which the pressure in the condenser increases with the surrounding temperature, the resilient forces applied to the movable assembly also increase, which has the effect of causing the compressor to operate nearer to resonance, and consequently, in output conditions which increase with the work to be accomplished

According to the present invention an electro-magnetically driven oscillating movement compressor comprises a magnetic circuit provided with two identical oppositely disposed magnetic cores each having three branches delimiting poles and a coil directly supplied with alternating current, said magnetic cores being spaced by an interval in which is located a movable oscillatory armature which drives a compressing member, said armature being provided with two permanent magnets parallely disposed to each other and terminated by pole shoes, the width of the pole shoes and of the branches and the spacing of the magnets and branches being so chosen that, when at rest, the lateral edges of the pole shoes are placed in front of the lateral edges of said poles respectively delimited by said three branches of the magnetic cores.

Various other characteristics of the purpose of the invention will moreover be revealed in the detailed description which follows.

One form of embodiment of the compressor of the invention is shown, by way of an example in the attached drawings.

Fig. 1 is a sectional elevation of the compressor according to this invention, this being taken along the line I—I of Fig. 2;

Fig. 2 is a section, on a smaller scale, taken along the line II—II of Fig. 1, and having a portion cut away; and

Fig. 3 is a section taken along the line III—III of Fig. 2.

The compressor shown in the drawings comprises a supporting plate 2 consisting a framework and serving as a bearing for a flexible plate 9. The flexible plate 9 carries at its free end, a part 10 made of a magnetic metal but conductive of electricity, serving for embedding the permanent magnets 11 and 12.

The part 10 also serves to operate a flexible rod 15, at the end of which is mounted a piston 16 constructed to slide in a cylinder 17 in a casing 18 fixed to the plate 2.

21 designates a valve provided in the same manner as the piston 16 with a distortable resilient packing, this valve insulating the inside of the cylinder 17 from a chamber 20 in which the coolant is compressed by the piston 16 when the compressor is working, this coolant being then directed towards a condenser.

The compressor mechanism is resiliently suspended by means of springs 50 inside a tank 51 which is traversed by the various input and output ducts for the coolant and which is closed by a cover 52 whose shape is chosen so that its bent-back marginal edge 53 penetrates inside the tank 51 to which it is then welded at 54, thus ensuring absolute tightness for the enclosure thus constructed.

The permanent magnets 11 and 12, whose polarities are opposed as can be more particularly seen in Fig. 3, are provided at their ends, which project on each side of the support part 10 which otherwise envelopes them, with pole shoes 55 made of soft iron.

The magnets 11 and 12 are intended to be moved in an alternating manner in the air-gap of a magnetic circuit 56 which comprises two identical magnetic cores 57, 58 of magnetic steel sheets piled one on the other and fixed by bolts to lugs 59 connected to the plate 2 (Fig. 2).

In certain cases, it is advantageous, to avoid magnetic losses, that the cores 57, 58 be magnetically insulated from the plate 2.

Each of the cores of the magnetic circuit has two lateral branches 60, 61—60*a*, 61*a* (Fig. 3) and a median branch 62, 62*a*. The median branches 62, 62*a* delimit the poles, the width thereof being selected so that it is substantially equal to the space separating the corresponding pole shoes 55 of the two permanent magnets 11, 12, whose width is so chosen that the lateral edges of these pole shoes are placed in front of the lateral edges of the poles of the median branches 62, 62*a* and respectively of the lateral branches 60, 60*a* and 61, 61*a*.

The width of the poles of the lateral branches 60, 61 and 60*a*, 61*a* is less than that of the poles of the median branches 62, 62*a*.

63 and 64 designate two coils which are respectively slipped on to the median branches 62 and 62*a*. The coils 63, 64 are designed to be directly fed with alternating current and are connected up so that the polarities which appear on the poles of these branches 62, 62*a*, when the coils are fed, are opposed at a given time.

As will be observed from the foregoing description, when the compressor is out of action and consequently the magnets 11 and 12 are placed as shown in Fig. 3, the lines of force of the permanent magnetic field that they create closes across the two magnetic cores 57, 58 of the magnetic circuit, the lines of force passing at the same time by the median branches 62, 62*a* and the lateral branches 60, 61 and 60*a*, 61*a*.

When, on the other hand, the coils 63, 64 are fed with alternating current, for the first alternation of this current, the field produced by the coils closes, for example, through the median branch 62, the lateral branch 61, the magnet 12, the lateral branch 61*a*, the median branch 62*a* and the magnet 11.

As will be seen, the magnets and hence the thin plate 9 and the piston are displaced in the direction of the arrow f_1 (Fig. 3). The electro-magnetic field passing through the permanent magnets is directed in the same direction as the permanent magnetic field of these permanent magnets, and hence, the latter run no risk of becoming demagnetized.

At the following alternation of the alternating current, the field produced by the coils closes through the median branch 62, the lateral branch 60, the magnet 11, the lateral branch 60*a*, the median branch 62*a* and the magnet 12. The two magnets are consequently moved in the opposite direction to that of the arrow f_1, but similarly into a position in which the lines of force coming from the alternating field are sent in the same direction as the lines of force coming from the permanent magnetic field, and it follows that the magnets never run the risk of becoming demagnetized.

Another advantage of the arrangement described and of using pole shoes 55 lies in the fact that in the case of an excess voltage of the feed current, more particularly when starting up, certain of the lines of force may pass through the pole shoes without traversing the magnets which are thus protected even when their movement is delayed with regard to the alterations of the alternating current.

It is possible to mount several compressors like those described above, in series, possibly by coupling them up to each other. This arrangement is particularly interesting, especially in the case of three-phase feed current networks, which enables three compressors of the kind described above to be mounted, for example, in a Y-connection.

A modified form of construction is disclosed and claimed in our co-pending Application No. 9128/56, (Serial No. 829,781) from which the present specification was divided.

WHAT WE CLAIM IS:—

1. An electro-magnetically driven oscillating movement compressor comprising a magnetic circuit provided with two identical oppositely disposed magnetic cores each having three branches delimiting poles and a coil directly supplied with alternating current, said magnetic cores being spaced by an interval in which is located a movable oscillatory armature which drives a compressing member, said armature being provided with two permanent magnets parallely disposed to each other and terminated by pole shoes, the width of the pole shoes and of the branches and the spacing of the magnets and branches being so chosen that, when at rest, the lateral edges of the pole shoes are placed in front of the lateral edges of said poles respectively delimited by said three branches of the magnetic cores.

2. A compressor as claimed in Claim 1, wherein said coil with which each one of the magnetic cores is provided is fitted on the median branch thereof.

3. A compressor as claimed in either of Claims 1 or 2, wherein the electrical connection of the respective coils fitted on the two opposite magnetic cores is so selected that the corresponding poles are provided with the opposite polarities and said two permanent magnets of the armature mounted to have opposite polarities.

4. A compressor as claimed in any one of Claims 1 to 3, wherein said movable armature is carried by a vibrating flexible plate and is connected to a reciprocatable piston.

5. An electro-magnetically driven oscillating movement compressor, substantially as hereinbefore described and illustrated in the accompanying drawings.

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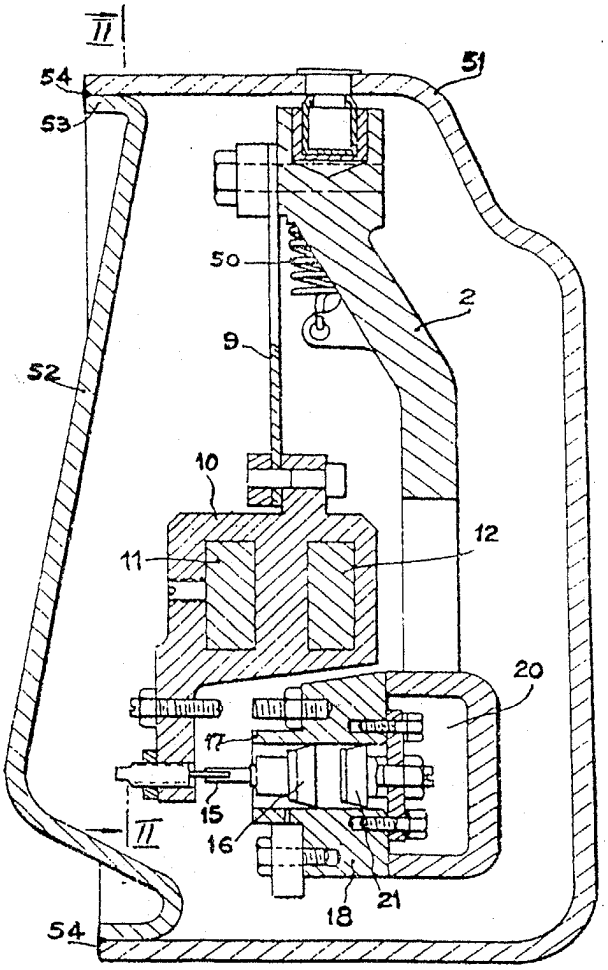
Fig. 1.



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2 SHEETS This drawing is a reproduction of the Original on a reduced scale.
SHEETS 1 & 2

Fig.1.

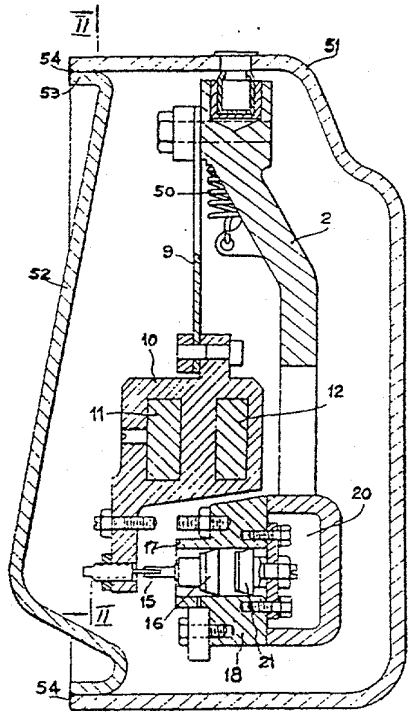

Fig.2

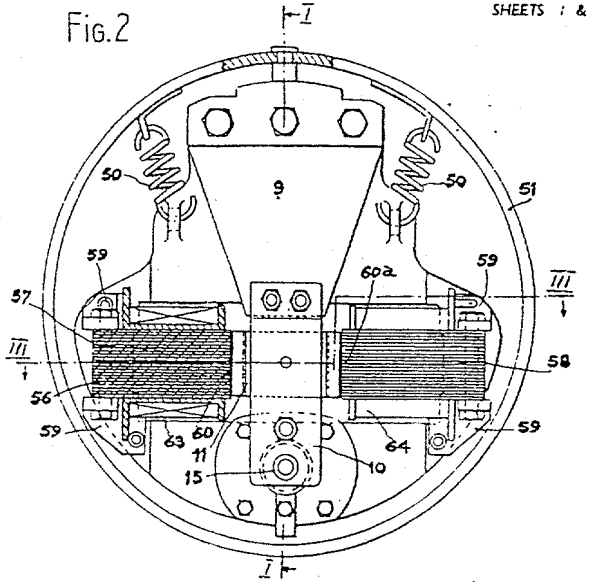

Fig.3.

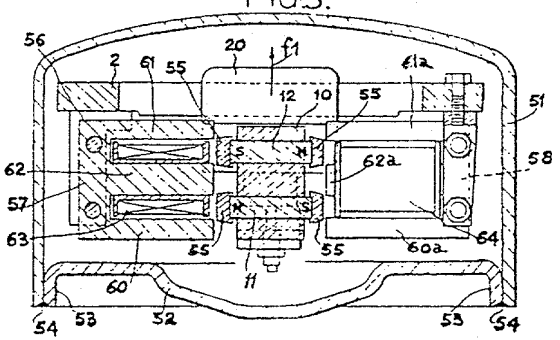

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Fig.2

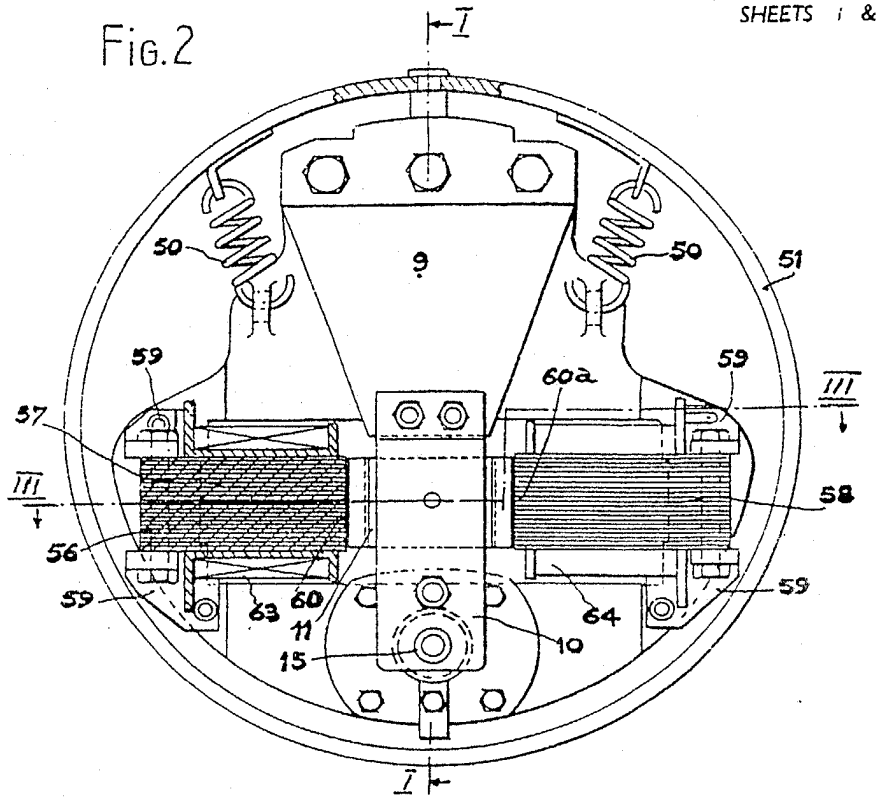

Fig.3.